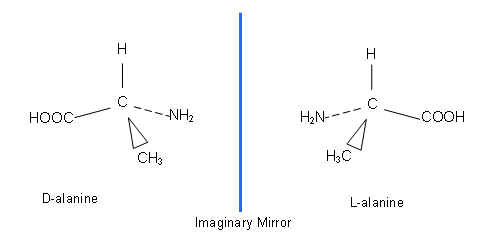
ANSWERS: **Constitutional isomers and stereoisomers**

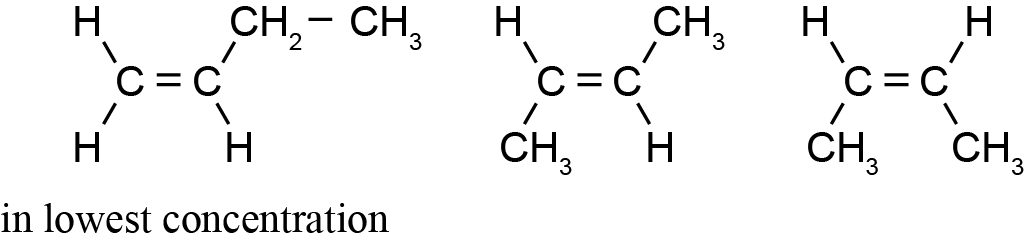
**1.** A chiral compound contains a carbon atom with 4 different groups attached.

Same – boiling point / melting point / density / solubility.

Different – enantiomers rotate plane-polarised light in different directions



**2.**



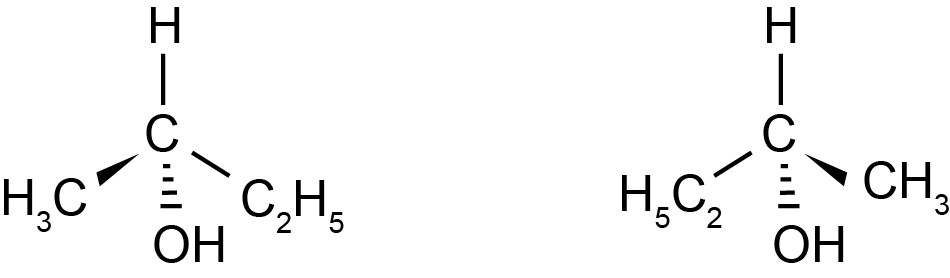
The minor product is but-1-ene.

Saytzeff’s rule: the minor product will have the least substituted double bond OR

Saytzeff’s rule is explained.

Eg: the minor product is formed by the removal of the OH group and a hydrogen atom is removed from the carbon adjacent to the C-OH that has the most hydrogens.

**3. a) i)**



or any similar structures that are enantiomers

**ii)** Enantiomers exist for atoms containing a carbon atom with 4 different groups attached / Non-optically

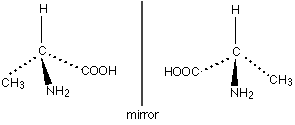
active substances do not have any carbon with 4 different groups attached.

Enantiomers rotate (plane) polarised light in opposite directions.

**b)**



**4.**



|  |  |
| --- | --- |
| P | Q |

P exists as an enantiomer as there is a chiral carbon in it. This is a carbon atom that has 4 different groups bonded onto it. This means that if the molecule is flipped over it will not be able to be superimposed onto its optical isomer.

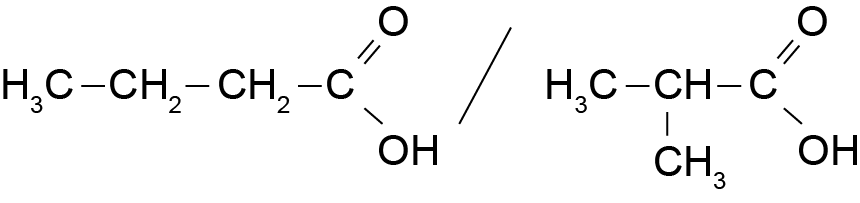
**5.**  **i)** A carbon atom must have four different groups / atoms.

**ii)** They rotate (plane) polarised light in opposite / different directions OR they undergo stereospecific reactions e.g. enzymes, smell.

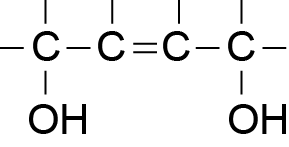
**iii)**



**6. Compound A**

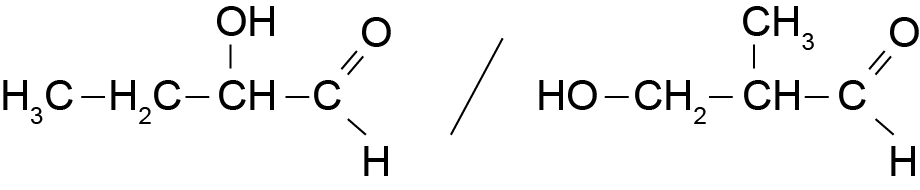


alkene with two OH groups anywhere.

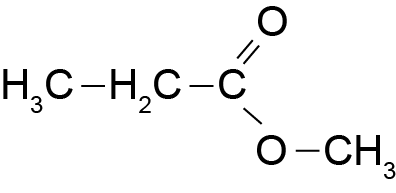


accept –OHs anywhere

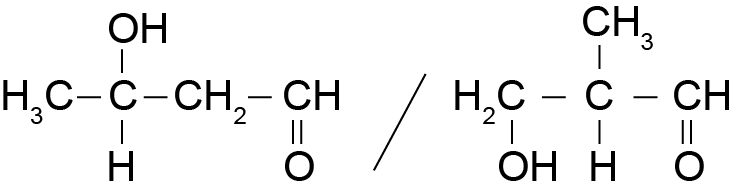
aldehyde = butanal – with one –OH group coming off any C atom.

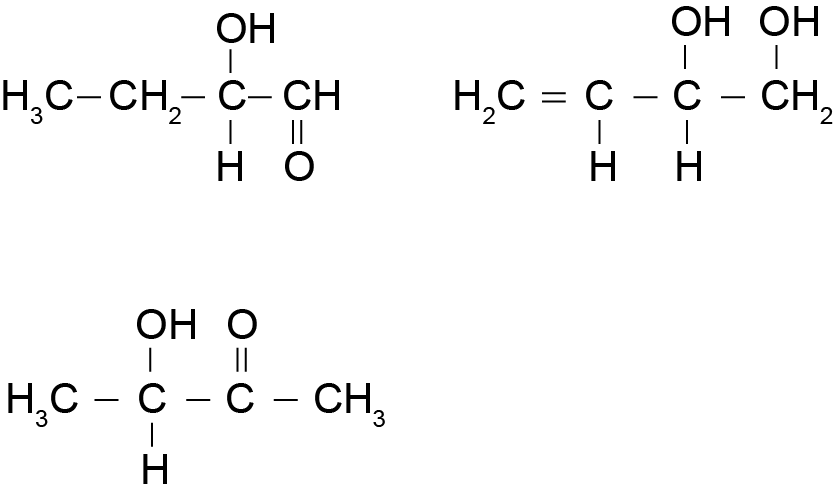


ester



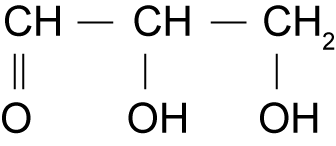
**ii)**





This isomer contains an asymmetric C atom. Four different groups are attached to the chiral carbon. (substituents) (Not four different functional groups/species.) (Accept list of groups.)

**7. i)**



The middle/central/second carbon has four different groups/groups of atoms attached.

(not four different functional groups) (accept list of groups)

**ii)** Optical isomers rotate plane polarised light in **opposite** directions.

**8.**

|  |  |
| --- | --- |
| A: Secondary alcohol | B: Tertiary alcohol |

Isomer D has four different groups attached to one of the carbon atoms.

**9. i)**

|  |  |
| --- | --- |
| 90698assq3ai |  |
|  | 90698assq3aiv |

**ii)** Butan-2-ol identified.

**iii)** Optical isomers rotate plane polarised light in opposite directions.

**10.**

|  |  |
| --- | --- |
| **a)**  90698q2aass | **b)** Compound does not have a chiral carbon - a C with 4 different groups attached. |

**11. i)**

|  |  |
| --- | --- |
|  |  |

**ii)** Name and structural formula of methyl ethanoate or ethyl methanoate or other valid compounds.

**iii)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Property** | **Carboxylic acid** | **Ester** |
| **Physical** | **Smell** | Acrid | Sweet, fruity |
| **BP** | Higher | Lower |
| **Solubility** | Soluble in water | Lower solubility |
| **Chemical** | **pH** | Low | Neutral |
| **Reactions** | Weak acid reactions | No acid properties |

**12.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | |  |  | | --- | --- | | Compound B (cis) | Compound C (trans) | |

**13. i)**

|  |  |
| --- | --- |
|  | **ii)** Solutions rotate plane polarised light in different directions. Same physical properties eg same bp, mp, density, polarity; very similar chemical properties (identical in reaction with optically inactive molecules because the same bonds will be broken). |

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